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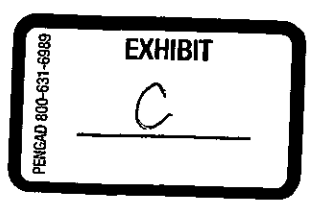

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Office of the Assistant Secretary for Housing-Federal Housing Commissioner

24 CFR Part 3280

[Docket R-93-1497; FR-2522-F-03]

RIN 2502-AE66

Manufactured Home Construction and Safety Standards

AGENCY: Office of the Assistant Secretary for Housing-Federal Housing Commissioner, (HUD).

ACTION: Final rule.

SUMMARY: HUD is amending the Federal Manufactured Home Construction and Safety Standards (FMHCSS) to include preemptive standards significantly upgrading the existing energy conservation requirements. The ventilation and indoor air quality standards for manufactured homes are also being updated to provide for proper ventilation of homes.

Other sections of the FMHCSS are also being changed to update the standards for components and products that are used in manufactured homes. Finally, certain changes have been made based on the recommendations by the Council of American Building Officials (CABO) and the MHCSS Consensus Committee (MCC).

DATES: *Effective date:* October 25, 1994. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of October 15, 1993.

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SUPPLEMENTARY INFORMATION:

I. Background

The National Manufactured Housing and Construction and Safety Standards Act of 1974, 42 U.S.C. 5401 et seq. (Act), authorizes the Secretary of Housing and Urban Development (Secretary) to establish and amend the Federal Manufactured Home Construction and Safety Standards (FMHCSS), 24 CFR part 3280 (Standards). The stated purposes of the Act are to reduce the number of personal injuries and deaths and the amount of insurance costs and property damage resulting from manufactured home accidents and to improve the quality and durability of manufactured homes. In accordance with the Act and these purposes, the Department is issuing these changes to the FMHCSS.

The Housing and Community Development Act of 1987, amended the Act to require preemptive energy conservation standards. The new subsection of section 604 of the Act is as follows:

(i) (1) The Federal manufactured home construction and safety standards established by the Secretary under this section shall include preemptive energy conservation standards according to this subsection.

(2) The energy conservation standards established under this subsection shall be cost-effective energy conservation performance standards designed to ensure the lowest total of construction and operating costs.

(3) The energy conservation standards established under this subsection shall take into consideration the design and factory construction techniques of manufactured homes and shall provide for alternative practices that result in net estimated energy consumption equal to or less than the specified standards.

Congress gave the Department further guidance concerning the development of these energy conservation standards in the Energy Policy Act of 1992. Section 104(c), Exception to Federal Preemption, states that if the Department has not issued thermal insulation and energy efficiency standards for manufactured homes that take effect before January 1, 1995 by October 24, 1993, the States may issue separate standards for thermal insulation and energy efficiency.

However, the state standards must be at least as stringent as the Second Public Review Draft of the BSR/ASHRAE 90.2 P entitled "Energy Efficient Design of Low-Rise Residential Buildings." Secondly, the State standards must take into account all public reviews of Independent Substantive Changes to BSR/ASHRAE 90.2 P that have been approved by October 24, 1993.

The Department believes that Congress intended that these energy conservation measures be issued promptly so that consumers would be able to purchase more energy efficient homes. The Department is hereby issuing this final regulation to establish these energy conservation standards for manufactured homes.

II. Development of the Energy Conservation Standards

To comply with the Housing and Community Development Act of 1987, the Department contracted with the Pacific Northwest Laboratories (PNL) to assist in developing a revision to the existing energy conservation requirements in the FMHCSS. The developed revision is based upon the requirement to ensure the lowest total of construction and operating costs. This revision was published as a proposed rule for public comment on February 24, 1992 (57 FR 6420).

The approach used in developing the energy conservation standards revision is a cost-benefit analysis (life-cycle cost analysis) in which the costs of energy conservation measures (ECMs) were balanced against the benefits of energy savings. The life-cycle cost (LCC) compares the total long-run (present value) dollar costs for an objective achieved through several alternative courses of action and selects the course of action that achieves the objective for the least cost.

For this LCC analysis, the benefit is the energy savings from the ECMs; the major cost is the ECM cost, including the associated mortgages, fees, and payments. Maintenance expenses were also included as costs. The resulting optimum value was used to specify an overall level of energy conservation in terms of a building shell U-value (thermal conductance) that produced the lowest life-cycle cost to the owner of a manufactured home.

Automated Residential Energy Standard (ARES) Software

The analysis to develop the standard was done with the Automated Residential Energy Standard (ARES) software. ARES was developed by the U.S. Department of Energy (DOE) specifically for the development of residential energy conservation standards. Given a set of fuel price, financial, economic, and ECM costs for a building at a specific location, ARES identifies the set of ECMs to invest in such that the purchaser's total life-cycle cost is minimized.

Rather than selecting a few cities to represent the U.S., all 881 cities available in ARES were used. Selection of all 881 cities included in ARES provided a density of locations such that any point in the U.S. was close to a city for which an optimum U value was produced. This coverage alleviated any bias which might have resulted from selecting a small number of cities to encompass the large area of the country.

Credit for High Efficiency Heating/Cooling Equipment. Calculating the Uo Value

In the proposed rule, the Department proposed a method for giving credit for high efficiency heating/cooling equipment. This would provide manufacturers with the flexibility to provide lesser insulation levels provided that the heating/cooling equipment exceeded the fuel efficiency used in calculating the Uo values for the home.

The MCC proposed that the Department permit credits in three areas:

1. Solar water heaters;
2. Infiltration control; and
3. High-efficiency equipment.

Departmental Views on the Issues Raised by the Commentators

To assure the proper treatment for energy efficient heating/cooling equipment, HUD asked PNL to evaluate the proposed credits suggested by the MCC. Based on PNL's opinion, the Department has determined that the estimated credits are excessive, due to the fact that the MCC analysis assumes that a fractional change in equipment efficiency translates directly to the same fraction change in the required Uo yields.

The reduction in the Uo value is less than the increase in equipment efficiency (Revision To The Energy Conservation Requirements In The Manufactured Home Construction and Safety Standards—Appendix F—HUD User 005943). Further, the reduction in the Uo value should never be less than the change in the equipment efficiency (Appendix F).

The MCC calculations are not consistent with this principle. That is, the base case is the NAECA minimum for manufactured home fossil fuel furnaces, with an AFUE of 75. The MCC gives credits for two levels of equipment efficiency, AFUEs of 80 and 90, which yield an increase in efficiency of almost 7% and 20% (75/80 and 75/90) respectively. The increase in the allowed Uo value should be less than this.

Similarly, the MCC proposal includes a credit for solar water heaters which is excessive. The Department of Energy's Energy Information Administration (EIA) has determined that the hot water heating is only about 15% of total residential energy use. PNL has prepared the following table which shows the approximate solar savings implied by the change in Uo values in the four proposed zones.

TABLE D.—APPROXIMATE SOLAR SAVINGS

	Base Uo	Solar	HVAC change (percent)	Change required (percent)
Zone I	0.126	0.155	+23	−69
Zone II ..	0.110	0.148	+35	−104
Zone III ..	0.092	0.128	+39	−117
Zone IV ..	0.098	0.117	+19	−58

Note that Zones II and III are estimated to require saving more than 100% of the water heating energy, which makes them unlikely. In general, solar water heaters meet a fraction of the water heating energy demand. It is seldom economical or practical to design a solar water heating system which meets 100% of the water heating need. There is also generally a need for electricity to pump the water being heated in the solar system. Finally, it should be noted that the MCC proposal did not include any specification for how large or effective the solar water heater was to be.

Based on the analysis enumerated above, we have concluded that the MCC proposed recommendations are not technically supportable and the methodology proposed by the Department in the February 24, 1992 proposed rule, should be included in the final rule. This methodology for alternative heat loss calculations of energy usage is contained in the publication "Overall U-Values and Heating/Cooling Loads—Manufactured Homes, PNL 8006, February 1992—§ 3280.506(b) (HUD User-005945). Other similar calculations could also be acceptable provided that all of the factors indicated in the HUD User-005945, Overall U-Values and Heating/Cooling Loads—Manufactured Homes, PNL 8006, February 1992—§ 3280.506(b), are covered.

V. Ventilation and Indoor Air Quality Standards

In conjunction with the proposed energy conservation standards, the Department is amending the standards to address the issues of condensation control and indoor air quality. The basic purpose of the ventilation standards is to prevent the potential deterioration of the home due to the accumulation of moisture and to obtain a satisfactory living environment.

The tighter construction of the homes that will occur as a result of the new energy conservation standards reduces the natural air flow in and out of these homes. This reduced number of natural air changes raises the concern about indoor air quality. The Department has concluded that the issues of condensation control and indoor air quality require more effective standards for ventilation and vapor retarder placement.

Three sources of input have been used in developing the final standard for indoor air quality and ventilation:

1. ASHRAE 62–1989 which was the fundamental document which the proposed rule was based upon.
2. Public comments from consumers, manufacturers, trade associations and other interested parties.
3. An independent reviewer, FPL/NIST, that was used to determine the merits of all comments.

HUD's conclusions are embodied in the language of the rule.

To provide adequate ventilation for the interior of the home, the Department proposed that a combination of mechanical and passive systems be used. Each home would be designed with the capability to change the indoor air at the rate of 0.35 air changes per hour. HUD originally proposed a 75 cubic feet per minute intake with an exhaust system providing at least 50 cubic feet per minute exhaust.

The ventilating system would have to be capable of operating independently of the heating or heating and air conditioning function, but may be integrated with the main blower system. The Department proposed that a system may have automatic controls, but should be manually operable.

The Manufactured Home Advisory Council (the Council) met on July 13–14, 1993. The Council made this recommendation to the Department:

The Department should withdraw the proposed ventilation provisions in Subparts B and F and rewrite the proposal based on the Forest Products Laboratory (FPL) and National Institute of Standards and Technology (NIST) research. Also, the Department should undertake a cost benefits justification and solicit input from the public using negotiated rulemaking or "other processes". To the extent possible, the ventilation standards should be promulgated along the same time lines as the energy standards for implementation at the same time.

Members of the Advisory Council also made several comments concerning condensation problems. One council member said that indoor air quality solutions should be left up to manufacturers while another member said that some manufacturers will not include ventilation without mandatory standards. Another member of the Council said that there are considerable problems with moisture in the Northwest and that something should be done.

The Advisory Council members noted the work that had been done by FPL/NIST and several members indicated that HUD's final proposal should be patterned on the FPL/NIST report. The Council was also concerned about the October 24, 1993 deadline for the issuance of the energy conservation measures and the Council wished to see a better cost/benefit analysis.

The Advisory Council's recommendation on the ventilation standard consists of four parts:

1. The Department should use the FPL/NIST report in determining the ventilation standards.

2. The Department should undertake a cost benefit analysis of the ventilation standards.

3. The Department should solicit input from the public using negotiated rulemaking or "other process".

4. The ventilation standards should be promulgated along the same time lines as the energy standards for implementation at the same time.

Concerning the FPL/NIST report, HUD had contracted with these organizations to provide an independent and authoritative assessment of the public comments and the original proposed rule. The Advisory Council was supportive of the recommendations contained in the 1993 FPL/NIST report. Also, the FPL/NIST report is current and is based on ASHRAE 62–1989.

The Department and the Advisory Council both agree with the basic conclusions contained in the FPL/NIST report. Almost all of the recommendations presented by FPL/NIST were accepted by HUD. Some of their recommendations were modified to address the particular needs of manufactured homes. Also, several recommendations, such as requirements for the location of the wall vapor retarder, will be addressed in future revisions to the FMHCSS.

The next issue raised by the Council was the need for a cost benefit study of the ventilation standard. To ensure that the cost estimates are reflective of actual conditions, HUD has expanded the number of cities used in its study to obtain better precision for ventilation costs. This matter was previously covered as part of the discussion of the overall cost of the new Uo requirements on consumers (see Section IV D). It should be noted that even if the cost of ventilation equipment is added to the cost of the energy conservation measures, the overall energy and ventilation standard remains cost effective.

Concerning the solicitation of input and the use of negotiated rulemaking, the Department has compiled an extensive public record on the ventilation standard, including the recommendations of the Advisory Council. Given the level of input shown in the public record and the study by FPL/NIST, the Department believes that negotiated rulemaking would not be appropriate and that the Department should proceed with the issuance of the final standard.

Finally, the Advisory Council recommended that the ventilation standards should be implemented at the same time as the other energy standards. We agree with this recommendation and therefore, the Department has determined that the energy and ventilation standards should be promulgated and made effective 12 months after the publication of the final rule.

Considerable public comments were received on interior mechanical ventilation. Several commentators expressed strong support for strengthening the current requirements for ventilation and there was generally no objection to using ASHRAE 62–1989 as a basis for ventilation standards for manufactured homes. Only one commentator opposed any change to the current standards, because in the commentator's opinion, even the current standards were not enforced sufficiently.

Most commentators generally accepted a target ventilation rate of 0.35 ACH as desirable. Several commentators stated that there is insufficient technical background information and justification given in the proposed rule. A number of disagreements focused on specific implementation of the standard and requirements that were perceived to go beyond ASHRAE 62–1989. These requirements include the mandatory installation of mechanical ventilation and HUD's rejection of openable windows as an alternative to mechanical ventilation.

The Bonneville Power Administration (BPA), which is part of the Department of Energy, agreed with HUD's assessment that homes are being built relatively air tight and that an unacceptably low natural infiltration rate would result from further air tightening. They also felt that, even though manufacturers are constructing air-tight homes now, there is no incentive for them to continue to do so. While some manufacturers may be producing air tight units at the factory, this does not guarantee they will remain at the same airtightness level after being transported to the site and undergoing the necessary set-up preparation (i.e., plumbing, electrical, HVAC, drainage, etc.) BPA suggested that testing be required to assure units will perform at the stated maximum air tightness level.

BPA also recommended that some alternative method of infiltration control or ventilation equipment should be considered for a trade off credit, similar to the credits given for higher efficiency heating and air conditioning equipment. They felt that a considerable variety of cost effective equipment is available, which provides numerous alternatives to the manufacturers.

One major consumer organization wanted to increase whole house air flow beyond .35 air changes per hour (ACH). They stated that while .35 ACH is a reasonable ventilation level in most cases, the capacity to exceed this level is very important in smaller housing units or in housing units with a higher than average number of occupants. Further, additional ventilation capacity is particularly important in the first year of a new home, because building materials emit a variety of substances, including moisture. These substances can have significant negative impacts on an occupant's health and compound the problem of condensation control.

The Use of American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 62–1989

HUD has concluded that the supporting documentation provided by FPL and NIST provides good technical [redacted] to use the ASHRAE 62–1989 standard. They submitted a report to HUD which detailed their moisture determinations. This report, entitled Ventilation, Moisture, and Indoor Air Quality in Manufactured Houses, February, 1993, is available from HUD User.

ASHRAE originally established the ventilation rate of .35 ACH by a consensus process. It has been carefully researched and is considered to be the most authoritative and accurate document available. Most of the commentators did not object to using this document as a basis for our ventilation.

Accordingly, the Department has determined that the ASHRAE 62–1989 target of 0.35 air changes per hour is proper for the anticipated usage and occupancy level of manufactured homes. Use of enhanced ventilation for periods of unusually high occupancy or during the first year of occupancy while not required would be recommended. The value of .35 ACH is based on obtaining good indoor air quality under normal conditions.

ASHRAE also states that additional ventilation is needed to accommodate the requirements of the installed fuel burning equipment. If manufactured homes did not have sealed combustion chambers, which obtain air for combustion directly from the outdoors, even more ventilation would be needed.

Concerning the use of openable windows to provide ventilation, we acknowledge that in theory, it is less expensive to use windows rather than mechanical ventilation. However, as noted in the public comments, some home owners would not use the windows on a regular enough basis to assure adequate ventilation. This tendency will be even more likely in cold climates.

In addition, an openable window does not provide for uniform ventilation of the home to the degree the fan system can provide. The validity of this concept is supported by the state of Alaska's specific request for mechanical ventilation. Their climate conditions are among the most severe in the United States. They said that mechanical ventilation provides better control of flow rates, air distribution and tempering means.

HUD acknowledges that a mechanical system could be disabled by the home owner. Nevertheless, we believe that the home owner will realize that the purpose of the ventilation system is for a healthy indoor environment and for the durability of the home.

Therefore, the Department has concluded that mechanical ventilation is necessary to obtain the level of ventilation specified in ASHRAE 62–1989. A requirement for mechanical ventilation at a rate of 0.35 CFM has been added.

Cost of Ventilation and Equipment

A number of commentators discussed the cost impact on homes. They said that the proposed requirements by HUD attempt to create acceptable indoor air quality by sacrificing energy conservation, without estimating the costs involved. Further, the commentators claim that the ventilation equipment has not proven to be reliable or effective; also, no evaluation of the operation and maintenance costs of the mechanical systems has been made. Concern was also raised that occupants would interfere with the proper operation of the equipment.

A number of commentators expressed concern that the new ventilation standards would be costly to install and the loss of heated air due to ventilation ("energy penalty") was not considered. HUD investigated this matter and has determined that the total costs for equipment and increased energy consumption are small. The retail cost of the installed equipment ranges from $200 to $300.

Two feasible types of equipment were considered: the furnace fresh air vent system and a separate exhaust fan with intake vents. Five cities were considered in this analysis: two northern cities and three southern cities. For both systems, the annual cost of the energy averaged $50, with a maximum of about $100.

While this will reduce the net savings from the ECMs, the purchase of ECMs remains cost-effective with substantial net savings for the consumer. Further, HUD believes the societal benefit derived from healthier living conditions should be considered; this benefit is at least implicitly accounted for in the ASHRAE 62–1989 standard.

We believe that the concern about the reliability, maintenance and durability of the ventilation equipment is overstated. This concern appears to be based on operating standard bathroom or kitchen fans, most of which were not designed or intended to be operated continuously. While the manufacturer will need to install a fan which is appropriate for the size of the home, a properly chosen fan can run continuously for years.

On a related matter, a number of commentators suggested using a blower door test to verify infiltration rates and duct leaks. HUD did not present this or any testing protocol in the proposed rule; HUD will consider this in future updates to the FHMCSS.

Kitchen and Bath Ventilation Rates

Kitchen and bath fans are installed to provide spot ventilation for the control of excessive moisture and odor. The HUD-code (24 CFR 3280, Subpart B) includes a requirement for an air change for the kitchen every 30 minutes. The proposed rule specifies a ventilation rate for the kitchen of 100 cubic feet per minute (CFM). The present HUD-code requires an air change every 12 minutes for bath and toilet areas. The proposed rule would be 50 cubic feet per minute in these areas. Ventilation through openable windows would not count as a ventilation method except for a separate toilet compartment. These rates conform to ASHRAE Standard No. 62–1989.

There was general agreement that the bath and kitchen fans should be capable of producing 50 and 100 CFM. This conforms to ASHRAE requirements, which are considered by most to be the best authoritative source; also, ASHRAE has a long history of development and consensus. The intent of these fans is to remove peak or spot ventilation needs. HUD accepted a suggestion that in a separate water closet compartment, an operable window will be allowed in lieu of mechanical ventilation. Because of the severity of the climate, manufactured homes destined for Alaska will not be allowed to use openable windows.

Attic Ventilation

In the February 24, 1992 proposed rule, ventilation would have been required for all attic and roof cavities with the exception of single-section homes that have metal roofs and no underlayment. All attic or roof cavities, except those on certain single-section homes, should be ventilated with at least 50% of the open free ventilation area in the upper half of the roof cavity.

The remainder of the vents would be equally dispersed in the eaves or a low location in the gabled ends. A free ventilation area equal to at least 1/300 of the attic or roof cavity floor area should be provided. In addition, both mechanical and passive ventilation of the roof cavity will have a 1-inch air gap between roof and insulation. This 1-inch gap also applies to cathedral ceilings.

The research on this subject indicates that attic or roof cavity ventilation is the primary and most reliable method of removing condensation. It also assists in providing a way for moisture to escape from the home that is not removed by other methods. This research, which was done in the late 70's also revealed that a vapor retarder should be utilized on the warm side of the attic or roof cavity. A prominent study was performed by Butch and Luna and is titled, A Mathematical Model for Predicting Attic Ventilation Rates for Preventing Condensation on Roofing Sheathing.

Alternatively, in the proposed rule, a mechanical system would be permitted in the attic or roof cavity to provide the ventilation. A minimum rate of 10 air changes per hour was included in the proposed rule, or 0.7 CFM per square foot of attic floor area. The mechanical ventilation was to be controlled by a switch with an automatic humidity sensor control.

Certain single section manufactured homes would be excluded from the attic and roof cavity ventilation requirements. These single wides were excluded because of economic considerations. However, additional requirements were imposed, such as the sealing of the ceiling diaphragm. Also, the Department proposed that an interior air exchange rate capable of at least 150 cubic feet per minute would be required.

Roof Cavity Ventilation

Generally, the comments supported most of HUD's proposed recommendations and confirmed HUD's view that attic ventilation is needed. Commentators indicated that HUD needs to provide industry with more flexible ventilation options in locating the open venting area and the ventilation reduction when a ceiling vapor retarder is installed. Many commentators agreed that the mechanical ventilation rate of 10 ACH is excessive. A few commentators indicated that the calculation of the roof cavity air change rate needs to be clarified. Several commentators raised the concern that roof cavity ventilation equipment would negatively pressurize the cavity, thereby causing indoor air to exfiltrate from the living space into the roof cavity.

Other commentators supported HUD's revision to the rule that permitted a sealed attic for certain single-wide homes. These homes would have special requirements including sealing of all air leakage sites in the ceiling. One commentator wanted this exception extended to double-wide homes. Another commentator stated that it would be difficult to seal all air leaks.

Many commentators agreed with HUD's decision to ventilate only homes having shingled roofs while some single section manufactured homes constructed with metal roofs will not require ventilation. Some suggested that a testing protocol be developed to guarantee proper sealing, possibly requiring a blower door test.

A manufacturer's experience indicated that most passive ventilation systems don't work as well in practice as in theory. An active ventilation system would be preferred provided it could be controlled by a humidity controller and would not provide positive pressure to the attic space. Some commentators had opposed mechanical ventilation saying that it would not be viable due to lack of air space volume and the potential for the system to fail.

One leading consumer organization supported HUD's requirement on roof ventilation. They believe that condensation damage has been a serious problem in manufactured housing and has resulted in expensive repairs and premature deterioration of homes. While maintaining the ASHRAE standard, this organization indicated that the Department should cooperate with other federal agencies, equipment producers and home manufacturers to undertake additional research. This should include field testing of ventilation systems and installation methods. The organization also believes this approach will result in the best method for meeting the standard.

Another commentator stated that the ventilation condensation proposal would impose unnecessary and costly new standards upon manufacturers. Further, they said HUD failed to cite any rationale or justification for the change, such as reported systemic failures in manufactured homes (roofing system), or evidence that manufactured homes suffer from poor air quality or excessive condensation.

A major utility company supported the proposed ventilation requirements for all attic or roof cavities. The utility stated that the implementation of passive and mechanical systems is necessary for condensation control. Also, these measures will improve indoor air quality for residents and prolong the life of the structure.

A number of commentators felt that 10 ACH for the mechanical ventilation of the roof cavity was excessive; this was based on a .7 CFM/ft2 of attic. HUD has determined that the rate for the roof cavity should be lowered to .02 CFM for every foot of attic floor area. FPL/NIST has investigated this matter and believes that this .02 CFM is reasonable.

In addition, many of the commentators concur with HUD's proposal to permit a sealed attic for certain single wide metal roof homes. The FPL/NIST recommendation allowed the option for the attic to be ventilated or sealed. However, FPL/NIST acknowledges that experience with construction standards over the years has indicated that ventilated attics work. Many of the commentators, including manufacturers of homes, support ventilating the attic.

Originally HUD proposed that single wide units with metal roofs would be required to have a minimum whole house mechanical ventilation rate of 150 CFM. Many commentators said the rate was excessive and not substantiated. These comments are supported by the recent report to us by FPL/NIST and the public comments. The report indicates that a whole house ventilation rate of 0.35 ACH is adequate, if the ceiling is sealed to prevent warm moist air from flowing into the unvented roof cavity. The requirement for single section homes with unvented roof cavities to have a whole house ventilation rate of 150 CFM is removed from the rule.

FPL/NIST, who did a recent study on attic ventilation, said they prefer a sealed attic for all homes; however, they also felt that a ventilated attic was acceptable. FPL and NIST said that cavity ventilation over the last forty years has been a way to avoid moisture accumulation but little technical basis exists to support this method. Computer simulation run using the NIST moisture model (MOIST) showed the drying and wetting effects in the attic caused by various conditions, such as climate, indoor relative humidity and ceiling infiltration.

Even though FPL/NIST are not convinced that roof vents are necessary, vents can usually be installed cheaply and easily without comprising the thermal integrity of the roof. Because of the many years experience in constructing vented attics, they recommended a parallel to other building codes: 1/300 vent area to atic floor area. HUD concurs with their recommendations.

They also recommended that the roof cavity have positive pressure and that cathedral ceilings not be ventilated. Furthermore, measurements on vented walls showed that vents may increase leakage of moist air into the cavity. This would cause structural and sheathing deterioration in the wall cavity. This deterioration would go unnoticed since the interior of the wall is not easily accessible.

HUD believes that additional analysis and research needs to be done before a final decision is made concerning sealed roof cavities. Consumer organizations also recommended more field testing and research. As a result, HUD intends to have NIST investigate issues related to attic ventilation and infiltration.

Concerning the comment that the new standard is costly and there is no "evidence" that a problem exists, HUD has investigated many claims of condensation and moisture problems. These problems were mainly in the northeast and southern regions. Most of the problems seem to be related to unvented attics.

Another commentator said that a blower door test protocol should be developed to insure the proper sealing of the ceiling. HUD has considered this suggestion but concluded that the added cost versus benefit does not warrant making this a requirement. Nonetheless, HUD will investigate and consider this in the next cycle of proposed changes to the standards.

The issue of the possible failure of the mechanical system was also considered by HUD. HUD expects the manufacturer to give instructions in the owners manual that will give some indication of the inspection and maintenance needed on these fan systems.

Moisture Control

The main issues in the proposed rule concerned vapor retarder placement, the

condensation control map and the sealing of penetrations.

Ceiling Vapor Retarders

HUD included in the February 24, 1992 proposed rule a requirement for a ceiling vapor retarder with a permeance no greater than 1 perm (dry cup method) installed on the living side of the roof cavity. Also, the ceiling vapor retarder could be omitted in the southern condensation zone. Finally, the term "ceiling vapor barrier" has been changed in the proposed rule to the term "ceiling vapor retarder."

A manufacturer suggested that a vapor retarder should be used in humid climates, but should not be mandatory since these areas are small geographically. The Oregon State Building Code agency suggested that the vapor retarder be placed on the living side of all manufactured homes. A leading consumer organization suggested that HUD specify one uniform location for the vapor retarder because differing locations would restrict the transportation of homes to other locations. This organization also recommended following the experience of the Pacific Northwest in the placement of the vapor retarder. Alaska considers their situation unique and stressed the need for a vapor retarder in all their homes.

The State of Colorado's Housing Office agrees with HUD that a vapor retarder is needed and all air leakage paths should be sealed. They also stated that improper sealing was a major problem. To alleviate this problem, they recommended a blower door test. An insulation association advocated deleting the vapor retarder in mild heating climates and hot and humid climates. They felt this would more easily accommodate reverse (heat/moisture) flows.

Another code agency suggested that HUD follow ASHRAE and the MEC standards. ASHRAE specifies a vapor retarder on the outside in warm climates and on the inside for cold climates. The MEC allows the omission of the vapor retarder in hot and humid climates and gave detailed parameters where this applies. Another association recommended the use of both a vapor retarder and attic ventilation. They said the proposed standard should reduce the incidence of condensation damage, while assuring new homes will be able to achieve a high level of energy efficiency.

FPL/NIST felt the vapor retarder should be placed on the inside in cool climates and on the outside in warm climates. They also made the vapor retarder optional for southern zones under certain building conditions. One commentator felt that a vapor retarder for crawl spaces should be specified in the homeowners manual.

The comments received concerning ceiling vapor retarders varied from recommending no vapor retarder to advocating a vapor retarder in certain weather conditions. No clear consensus seems to exist and very little analytical evidence was provided on the location and need for vapor or air retarders. Much of the public comment was based on experience.

HUD relied on the FPL/NIST study, Ventilation, Moisture, and Indoor Air Quality in Manufactured Houses, February 1993. Other reference standards, such as ASHRAE and the MEC, specify a vapor retarder on the inside for cold climates and on the outside for warm climates. This is similar to our proposed standard.

HUD has used the experience of the Pacific Northwest as much as possible but cannot directly apply their specifications to southern states and other climatic conditions. As with all homes in Zone III, a vapor retarder must be installed on all homes sited in Alaska.

The Department understands that the placement of a vapor retarder in one uniform location on all homes is desirable, so that the home can be moved from one location to another. However, a single location for the vapor retarder is not technically desirable. In addition, most homes, once originally sited, rarely are moved; if they are moved, the second destination is likely to be in the same climatic area.

Theoretical and practical evidence by known authorities and home manufacturers stressed the need for a vapor retarder that is a function of climate. The ASHRAE and the MEC standards also specifies a vapor retarder on the inside for cold climates and on the outside for warm climates.

Accordingly, the Department has determined that the ceiling vapor retarders may be omitted in Uo Zone 1 (see the map contained in Section IV). Also, the term "ceiling vapor barrier" has been changed to the term "ceiling vapor retarder."

The Department has determined that the test method, referred to as the dry cup method in the proposed rule, is referred to as the Desiccant method in the ASTM E–96–90 standard. Accordingly, the Department has amended § 3280.504(a) to include the ASTM E–96–90 Standard Test method for vapor transmission, the Desiccant method.

To control moisture, placing a vapor retarder on bare crawl space ground would be beneficial. However, since the set-up of and installation of the home is the responsibility of the local and state authorities, HUD does not have the authority to issue standards on this matter.

Condensation Control Map

In the original proposal, HUD used the ASHRAE condensation map of the United States.

Many commentators were concerned that the condensation control map was difficult to use and did not correspond to state boundaries, which made it difficult to determine the need and enforcement of the vapor retarder. Some commentators said that information concerning the condensation design zone of the home should be placed on the data plate, while others said it should be placed on the heating or cooling certificate. Other commentators said that a prospective second home buyer would benefit from this information and it would be more likely that the home would be placed in the correct condensation zone if the home were moved.

An insulation association generally agreed with the use of a vapor retarder, but was concerned about the interpretation of the condensation zone map. They recommended four zones that were similar to the thermal map: two zones would be hot and humid climates and two would be the cold climates. A code association said that the Canal Zone, Puerto Rico, and U.S. Virgin Islands should be included on the condensation control map.

The condensation control map was taken from the ASHRAE Book of Fundamentals. The ASHRAE zones were developed with the intent that local design engineers could determine the specific requirements for an individual home when they knew exactly the specific site location.

HUD agrees that the map is difficult to read and has redefined the zones to correspond to state borders by simply using the Uo zone map that is given in the energy conservation section (see Section IV E). HUD will also require the home's condensation design conditions of the home to be placed on the data plate. The three types of weather conditions are cold zone, hot zone, and hot and humid zone.

Air Leakage

There was concern about air leakage which could transport moisture and energy through the home envelope. The State of Minnesota was concerned about wind wash through the attic. They said that this causes considerable heat loss at the soffit-wall junction by displacing

entrapped conditioned air with outside air; a baffle can relieve this situation. In addition, the State of Minnesota wanted all penetrations sealed, including, but not limited to, the electrical, plumbing, flue and exhaust penetrations.

The State of Alaska was also concerned about air infiltration and extended Minnesota's recommendations. They added more prescriptive requirements to include the installation methods for doors and windows, and the sealing of major joint envelope elements. Further, they want to use the Canadian standard protocol for depressurization testing of homes. The State of Colorado agrees with the need for this test and felt it would also be effective in determining the leaks in the HVAC system.

A major home manufacturer and others pointed out that the ventilation equipment should exhaust indoor air directly to the outdoors, not into the roof cavity. Another commentator felt that exhausting indoor air into the roof cavity was acceptable.

Air infiltration/exfiltration can transmit considerable energy and humidity and many of the commentators expressed concern about sealing all potential leakage paths. New information presented in the technical journals indicates that leaks in the duct system can contribute as much as 25% to the energy loss in a home.

HUD agrees with Colorado's comment that all penetrations should be sealed; we also agree with Minnesota's suggestion to place air baffles in the soffit. The Department realizes that a blower door test is a good indicator of air leakage, but also realizes that this is an added cost, which may not be cost-effective. HUD is investigating these matters further and will consider them for the next standards update. The duct system issues will also be considered.

Ventilated Walls and the Location of Vapor Retarders in Walls

HUD asked for comments on the use of ventilated walls and the placement of the vapor retarder on exterior walls. The following questions were included in the proposed rule:

1. Given the need for improved thermal efficiency, should the Standards continue to permit the use of ventilated walls? Also, should the Standards limit the use of ventilated walls for use only with metal sided homes?

2. Should the placement and location of the vapor retarders in exterior walls be related to the condensation zone in which it is to be located?

Most of the comments received stated that the ventilated wall should not be allowed. In addition, the FPL/NIST study also corroborates this opinion. FPL/NIST stated that it will add moisture to wall as well as increase moisture in the attic. Also, it will lose considerable energy and potentially cause deterioration of the home structure.

HUD has reviewed the comments on the use of a ventilated wall. Since the Department did not propose a standard in this area, a decision on this issue will be included in future revisions to the FMHCSS.

The Placement of the Vapor Retarder in the Exterior Wall

Many of the comments discussed in the ceiling vapor retarder section would also apply to the placement of the vapor retarder in the exterior wall. As was stated previously, there is a wide range of views on the placement and need for a vapor retarder.

HUD has reviewed all of the comments concerning the placement and/or need for a vapor retarder on the exterior wall. Since the Department did not propose a standard in this area, a decision on this issue will be included in future revisions to the FMHCSS.

VI. General Update of the Standards

In order to remain abreast of the industries that utilize those reference standards incorporated in the FMHCSS, the Department is amending the FMHCSS to incorporate the latest edition of those standards and incorporate new relevant standards. Public comments concerning reference standards affirmed the Department's position that the reference standards should be updated to the most recent version, new reference standards should be incorporated when adopted by the affected industry, and out of date standards should be deleted. The commentators also expressed concern that the Department is not updating the reference standards often enough. The Department concurs and will be proposing amendments to the FMHCSS on an annual basis.

There was one new reference standard on which there has been significant comment and discussion. First, the Department proposed that "AAMA1503.1–1988, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections" be the appropriate standard for determining U-value of glazed products. Several commentators suggested that a more appropriate standard would be the "NFRC 100–91, Procedure for Determining Fenestration Product Thermal Properties." The reasons given for using the NFRC 100–91 are persuasive, better accuracy being the most significant.

However, the Department has not been given evidence that the AAMA1503.1–1988 is inadequate for the intended purpose. Also, at the present time, the NFRC procedures are being developed for the certification of windows and we have been informed that no certification labels for manufactured home windows have actually been issued by the NFRC. Therefore, the Department will consider the adoption of the NFRC in future revisions to the FMHCSS.

To provide an easy reference, the following table lists the reference standards found in the MHCSS by issuing organization. The organization name and address is underlined. The column to the right indicates the section of the Standards where the reference is used. To the left of the Standard, an asterisk (*) indicates that the Standard is updated. An "N" indicates the Standard is new.

Standards by issuing organization 24 CFR:

Aluminum Association, 900 19th Street NW., Washington, DC 20006

Specification for Aluminum Structures Construction Manual Series—Section 1, Fifth Edition—1986.

American Architectural Manufacturers Assoc., 1540 East Dundee Rd., Suite 310, Palatine, IL 60067

(N) AAMA 1503.1–88, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows Doors and Glazed Wall Sections—3280.508(e).

AAMA 1701.2–1985, Primary Window and Sliding Glass Door Voluntary Standard for Utilization in Manufactured Housing—3280.403(b), 3280.403(e), 3280.403(e)(2), 3280.404(b).

AAMA 1702.2–1985, Swinging Exterior Passage Doors Voluntary Standard for Utilization in Manufactured Housing—3280.405(b), 3280.405(e), 3280.405(e)(2).

AAMA 1704–1985, Voluntary Standard Egress Window Systems for Utilization in Manufactured Housing—3280.404(b), 3280.404(e).

American Forest and Paper Association (Formerly National Forest Products Association), 1250 Connecticut Avenue, NW., Washington, DC 20036

*Span Tables for Joists and Rafters, PS–20–70, 1992—3280.304(b)(1).

*National Design Specifications for Wood Construction, 1991 Edition, With Supplement, Design Values for Wood Construction—3280.304(b)(1).

* * * * *

27. Section 3280.403 is amended by revising paragraphs (d)(2) and (e)(1) to read as follows:

§ 3280.403 Standard for windows and sliding glass doors used in manufactured homes.

* * * * *

(d) * * *

(2) Sealed insulating glass, where used, shall meet all performance requirements for Class C in accordance with ASTM E–774–92, Standard Specification for Sealed Insulating Glass Units. The sealing system shall be qualified in accordance with ASTM E–773–88 Standard Test Methods for Seal Durability of Sealed Insulating Glass Units. Each glass unit shall be permanently identified with the name of the insulating glass manufacturer.

(e) * * *

(1) All such windows and doors shall show evidence of certification by affixing a quality certification label to the product in accordance with ANSI Z34.1–1987, "For Certification-Third-Party Certification Program."

* * * * *

28. Section 3280.405 is amended by revising paragraphs (c) (1) and (2) to read as follows:

§ 3280.405 Standard for swinging exterior passage doors for use in manufactured homes.

* * * * *

(c) * * *

(1) *Wood.* Doors shall conform to the type 1 requirements of ANSI/NWWDA I.S.1–87, Wood Flush Doors.

(2) *Plywood.* Plywood shall be exterior type and preservative treated in accordance with NWWDA I.S.4–81, Water Repellent Preservative Non-Pressure Treatment for Millwork.

* * * * *

29. Section 3280.406 is amended by revising the introductory text of paragraph (b) to read as follows:

§ 3280.406 Air chamber test method for certification and qualification of formaldehyde emission levels.

* * * * *

(b) *Testing.* Testing shall be conducted in accordance with the Standard Test Method for Determining Formaldehyde Levels from Wood Products Under Defined Test Conditions Using a Large Chamber, ASTM E–1333–90, with the following exceptions:

* * * * *

Subpart F—Thermal Protection

30. Section 3280.504 is amended by revising the section heading; by revising paragraph (a); and by adding a new paragraph (c) to read as follows:

§ 3280.504 Condensation control and installation of vapor retarders.

(a) *Ceiling vapor retarders.* (1) In Uo Value Zones 2 and 3, ceilings shall have a vapor retarder with a permanence of not greater than 1 perm (as measured by ASTM E–96–93 Standard Test Methods for Water Vapor Transmission of Materials) installed on the living space side of the roof cavity.

(2) For manufactured homes designed for U. Value Zone 1, the vapor retarder may be omitted.

* * * * *

(c) *Attic or roof ventilation.* (1) Attic and roof cavities shall be vented in accordance with one of the following:

(i) A minimum free ventilation area of not less than 1/300 of the attic or roof cavity floor area. At least 50 percent of the required free ventilation area shall be provided by ventilators located in the upper portion of the space to be ventilated. At least 40 percent shall be provided by eave, soffit or low gable vents. The location and spacing of the vent openings and ventilators shall provide cross-ventilation to the entire attic or roof cavity space. A clear air passage space having a minimum height of 1 inch shall be provided between the top of the insulation and the roof sheathing or roof covering. Baffles or other means shall be provided where needed to insure the 1 inch height of the clear air passage space is maintained.

(ii) A mechanical attic or roof ventilation system may be installed instead of providing the free ventilation area when the mechanical system provides a minimum air change rate of 0.02 cubic feet per minute (cfm) per sq. ft. of attic floor area. Intake and exhaust vents shall be located so as to provide air movement throughout space.

(2) Single section manufactured homes constructed with metal roofs and having no sheathing or underlayment installed, are not required to be provided with attic or roof cavity ventilation provided that the air leakage paths from the living space to the roof cavity created by electrical outlets, electrical junctions, electrical cable penetrations, plumbing penetrations, flue pipe penetrations and exhaust vent penetrations are sealed.

(3) Parallel membrane roof section of a closed cell type construction are not required to be ventilated.

(4) The vents provided for ventilating attics and roof cavities shall be designed to resist entry of rain and insects.

31. Section 3280.506 is revised to read as follows:

§ 3280.506 Heat loss/Heat gain.

The manufactured home heat loss/heat gain shall be determined by methods outlined in §§ 3280.508 and 3280.509. The Uo (Coefficient of heat transmission) value zone for which the manufactured home is acceptable and the lowest outdoor temperature to which the installed heating equipment will maintain a temperature of 70 F shall be certified as specified in § 3280.510 of this subpart. The Uo value zone shall be determined from the map in Figure 506.

BILLING CODE 4210-27-U

Federal Register

Thursday,
March 30, 2000

Part III

Department of Housing and Urban Development

24 CFR Part 3280

Condensation Control for Exterior Walls of Manufactured Homes Sited in Humid and Fringe Climates; Proposed Rule

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

24 CFR Part 3280

[Docket No. FR-4578-P-01]

Manufactured Home Construction and Safety Standards; Condensation Control for Exterior Walls of Manufactured Homes Sited in Humid and Fringe Climates; Notice of Proposed Regulatory Waiver

AGENCY: Office of the Assistant Secretary for Housing—Federal Housing Commissioner, HUD.

ACTION: Proposal of waiver; request for comments.

SUMMARY: This notice advises the public of HUD's proposal to issue a waiver of its regulations regarding manufactured home construction and safety standards. HUD may issue a final regulatory waiver after reviewing the public comments received in response to this notice. HUD proposes to waive certain provisions of these regulations when manufacturers, at their option, utilize the alternatives provided in this notice to reduce the problems currently being experienced in humid and fringe climate areas. Presently, there are no provisions in HUD's regulations that separately address condensation control and vapor retarder requirements for manufactured homes sited in warm, moist climates of the South Atlantic and Gulf Regions. The states have provided HUD with information that indicates there is an immediate need to consider alternate requirements for exterior walls in these humid and fringe climate areas, to prevent moisture damage due to condensation. HUD intends for this waiver to be in place for no more than 24 months, as permanent changes to the regulations are being considered.

DATES: *Comment due date:* May 1, 2000.

ADDRESSES: Interested persons are invited to submit comments regarding this notice to the Regulations Division, Office of General Counsel, Room 10276, Department of Housing and Urban Development, 451 Seventh Street, SW, Washington, DC 20410–0500. Communications should refer to the above docket number and title. Facsimile (FAX) comments are not acceptable. A copy of each communication submitted will be available for public inspection and copying between 7:30 a.m. and 5:30 p.m. weekdays at the above address.

FOR FURTHER INFORMATION CONTACT: Rebecca J. Holtz, Acting Director, Office of Consumer and Regulatory Affairs, Room 9146, Department of Housing and Urban Development, 451 Seventh Street SW, Washington, DC 20410–8000; telephone (202) 708–0502 (this is not a toll-free telephone number). Hearing or speech-impaired individuals may access this telephone number via TTY by calling the toll-free Federal Information Relay Service at 1–800–877–8339.

SUPPLEMENTARY INFORMATION:

I. Background

Manufacturers and State Administrative Agencies (SAAs) in southeastern States have recently reported an increase in the number and severity of consumer complaints caused primarily by moisture build-up and condensation in homes located in the south. They suggest this increase in complaints coincides with the Department's implementing more stringent energy efficiency requirements in its regulations regarding manufactured home construction and safety standards located at 24 CFR part 3280 (referred to as the "Standards").

At present, the Standards at 24 CFR 3280.504 do not distinguish between climates for requirements for condensation control and installation of vapor retarders. Thus, for example, the Standards do not separately address homes placed in humid and fringe environments or climates, which are predominantly located in the southeastern part of the United States. In these climates, it may be beneficial to prevent the outside, moisture laden air from entering through the warm (exterior) side of the home's exterior wall and condensing and collecting on the cold (living space or interior) side of the wall assembly. One means of preventing moisture from entering the exterior wall cavity from the outside, would be to install a vapor retarder on the warm or exterior side of the wall instead of on the interior or living space side of the exterior wall.

The interior surface of the exterior wall should also then be constructed of a permeable material. This would permit any moisture-laden air that may have entered the wall cavity through a discontinuity in the exterior vapor retarder to be dissipated through the interior permeable material. In such cases, use of vapor retarder paints, vinyl covered gypsum wallboard, or other impermeable materials or finishes on the interior side of exterior walls would be detrimental, because they would trap moisture within the wall.

II. This Notice

To address these concerns, HUD is considering issuing a waiver to the current condensation control and vapor barrier installation requirements for exterior walls in humid and fringe climates. Specifically, this waiver would allow for manufacturers, in humid and fringe climates, to install the vapor retarder on the exterior rather than interior or living space side of the exterior wall. The proposed waiver will permit manufacturers to locate the vapor retarder on the exterior side of the wall assembly provided there is no vapor retarder on the interior and the interior finish or interior wall panels are designed with a three perms or higher rating. The waiver will also require manufacturers to add a statement and a map to the data plate indicating that the home is only suitable for installation in humid and fringe climates and provide a map to designate the acceptable locations.

The Department intends for the final waiver to be effective for a period not to exceed 24 months. This will permit the Department to consider recommendations received from the National Fire Protection Association (NFPA), research, field data obtained from the use of this waiver, and other information to effectuate changes to the standards of a more permanent nature.

III. NFPA Consensus Standards Process

HUD has designated the NFPA to undertake a consensus process in developing recommendations for new manufactured housing standards. Participants in the NFPA process met in December 1999, to discuss comments received on recommended standards changes. One such recommendation that was discussed involved changes to HUD's regulation at 24 CFR 3280.504(b)(1) for homes sited in "humid climates" or "fringe climates" as set forth in figure 16, Chapter 21, 1989 ASHRAE Handbook of Fundamentals. (The Humid and Fringe Climate Map being proposed in this waiver is based on figure 16 in ASHRAE.) HUD looks forward to receiving the results of the consensus process and does not intend for this proposed waiver to undermine a consensus approach to standards revisions on this matter.

IV. Alternative Methods

This proposed waiver is not intended to limit alternate approaches by manufactured home producers in utilizing other solutions to assure that homes built and sited in warm humid and fringe climates are durable and free of moisture related problems. Other methods of moisture control that meet the intent of the 24 CFR part 3280 and this proposed waiver may be submitted for review and consideration in accordance with 24 CFR 3282.14

(entitled "Alternate Construction of Manufactured Homes").

V. Comments Requested

Comments are specifically requested on the Department's decision to proceed with a waiver in warm humid and fringe climates to permit the vapor retarder to be located on the warm side of exterior walls.

VI. Proposed Waiver

In accordance with 24 CFR 3280.8, the Secretary hereby proposes to waive the specific requirements of 24 CFR 3280.504(b)(1) for homes to be sited in a humid or fringe climate as identified in section VI.F. of this waiver. Manufacturers who elect to utilize this alternative rather than to follow the requirements of the existing standards in 24 CFR 3280.504(b)(1), must produce homes in accordance with the following requirements (all other requirements of the Standards continue to apply):

A. Exterior walls must be constructed with a vapor retarder of not greater than 1.0 perm (dry cup method) or an exterior finish and sheathing with a combined permeance of not greater than 1.0 perm installed on the exterior (warm side) of the wall assembly.

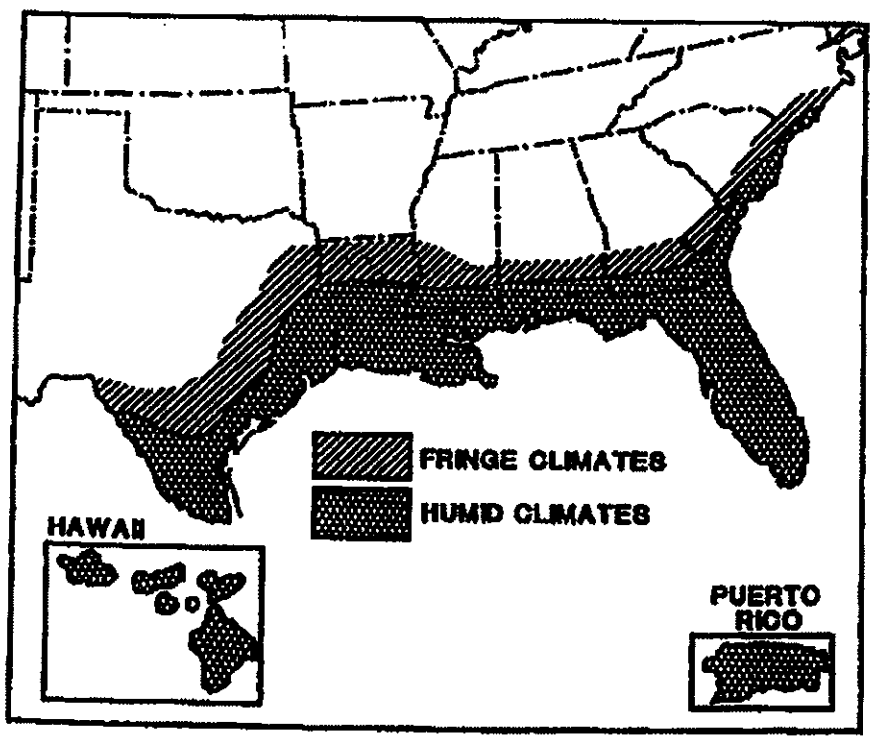
B. The interior finish and interior wall panel materials shall be designed to have a combined vapor permeance greater than 3.0 perms (dry cup method). Vapor retarder paint, vinyl covered gypsum wall panels, and other impermeable interior surfaces or finishes that have a combined rating less than 3.0 perms (dry cup method) shall be prohibited.

C. Exterior wall cavities shall not be ventilated to the outdoors.

D. An additional statement shall be provided on the data plate required by 24 CFR 3280.5 that indicates: "As designed and constructed, this home is suitable for installation only in humid and fringe climates as shown on the Humid and Fringe Climate Map provided with this data plate." The statement is to be typed in bold face using letters at least ¼ inch in size.

E. A reproduction of the following Humid and Fringe Climate Map is to be provided on the data plate.

Humid and Fringe Climate Map



F. The following areas of local governments (listed by State) are deemed to be within the humid and fringe climate areas shown on the Humid and Fringe Climate Map, and this waiver would apply to homes built to be sited within these jurisdictions:

Alabama

Baldwin, Barbour, Bullock, Butler, Chootaw, Clarke, Cofee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Lowndes, Marengo, Mobile, Monroe, Montgomery, Pike, Washington, Wilcox.

Florida

All counties and locations within the State of Florida.

Georgia

Appling, Atkinson, Bacon, Baker, Ben Hill, Berrien, Brantley, Brooks, Bryan, Calhoun, Camden, Charlton, Chatham, Clay, Clinch, Coffee, Colquitt, Cook, Crisp, Decatur, Dougherty, Early, Echols, Effingham, Evans, GlynnWayne, Grady, Irwin, Jeff Davis, Lanier, Lee, Liberty, Long, Lowndes, McIntosh, Miller, Mitchell, Pierce, Quitman,

Randolph, Seminole, Tattnall, Terrell, Thomas, Tift, Turner, Ware, Worth.

Louisiana

All counties and locations within the State of Louisiana.

Mississippi

Adams, Amite, Clairborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Issaquena, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Pearl River, Perry, Pike, Rankin, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson.

North Carolina

Brunswick, Carteret, Columbus, New Hanover, Onslow, Pender.

South Carolina

Jasper, Beaufort, Colleton, Dorchester, Charleston, Berkeley, Georgetown, Horry.

Texas

Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bexar, Brazoria, Brazos, Brooks, Burleson, Caldwell, Calhoun, Cameron, Camp, Cass, Chambers, Cherokee, Colorado, Comal, De Witt, Dimmit, Duval, Falls, Fayette, Fort Bend, Franklin, Freestone, Frio, Gavelston, Goliad, Gonzales, Gregg, Grimes, Guadalupe, Hardin, Harris, Harrison, Hays, Henderson, Hidalgo, Hopkins, Houston, Jackson, Jasper, Jefferson, Jim Hogg, Jim Wells, Karnes, Kaufman, Kennedy, Kinney, Kleberg, La Salle, Lavaca, Lee, Leon, Liberty, Limestone, Live Oak, Madison, Marion, Matagorda, Maverick, McMullen, Medina, Milam, Montgomery, Morris, Nacogdoches, Navarro, Newton, Nueces, Orange, Panola, Polk, Rains, Refugio, Robertson, Rusk, Sabine, San Augistine, San Jacinto, San Patricio, Shelby, Smith, Starr, Titus, Travis, Trinity, Tyler, Upshur, Uvalde, Val Verde, Van Zandt, Victoria, Walker, Waller, Washington, Webb, Wharton, Willacy, Williamson, Wilson, Wood, Zapata, Zavala.

Dated: March 23, 2000.

William C. Apgar,

Assistant Secretary for Housing-Federal Housing Commissioner.

[FR Doc. 00-7782 Filed 3-29-00; 8:45 am]

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Federal Register

Wednesday,
April 24, 2002

Part IV

Housing and Urban Development Department

24 CFR Part 3280

Condensation Control for Exterior Walls of Manufactured Homes Sited in Humid and Fringe Climates; Waiver; Final Rule

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

24 CFR Part 3280

[Docket No. FR-4578-F-02]

Condensation Control for Exterior Walls of Manufactured Homes Sited in Humid and Fringe Climates; Waiver

AGENCY: Office of the Assistant Secretary for Housing—Federal Housing Commissioner, HUD.

ACTION: Final waiver.

SUMMARY: This document advises the public that HUD is issuing a waiver of its regulations regarding the condensation control provisions for exterior walls of the manufactured home construction and safety standards. By this action, HUD is waiving certain provisions of these regulations to permit manufacturers, at their option, to utilize the alternatives provided in this notice to reduce the problems currently being experienced in humid and fringe climate areas. Presently, there are no provisions in HUD's regulations that separately address condensation control and vapor retarder requirements for manufactured homes sited in warm, moist climates of the South Atlantic and Gulf Regions. Based on information provided by the States and the public, HUD has concluded there is an immediate need to recognize alternate requirements for exterior walls in these humid and fringe climate areas that help prevent moisture damage due to condensation. By this action, HUD is finalizing its previously announced proposed waiver. This waiver will be in place while HUD considers a more permanent change to the standards.

EFFECTIVE DATE: April 24, 2002.

FOR FURTHER INFORMATION CONTACT: Elizabeth A. Cocke, Director, Manufactured Housing and Standards Division, Office of Consumer and Regulatory Affairs, Room 9156, Department of Housing and Urban Development, 451 Seventh Street SW, Washington, DC 20410–8000; telephone (202) 708–6409 (this is not a toll-free telephone number). Hearing and speech-impaired individuals may access this telephone number via TTY by calling the toll-free Federal Information Relay Service at 1–800–877–8339.

SUPPLEMENTARY INFORMATION:

I. Background

The Department published a proposed waiver to 24 CFR 3280.504 of the Manufactured Home Construction and Safety Standards on March 30, 2000 (65 FR 17110). The proposed waiver was issued in response to information received from manufacturers and certain State Administrative Agencies (SAAs) in southeastern States concerning a recent increase in the number and severity of consumer complaints caused primarily by moisture build-up and condensation in homes located in the south. They suggest this increase in complaints coincides with the Department's implementing more stringent energy efficiency requirements in its regulations regarding manufactured home construction and safety standards located at 24 CFR part 3280 (referred to as the "Standards").

At present, § 3280.504 of the Standards does not distinguish among climates for requirements for condensation control and installation of vapor barriers. [The term "vapor barrier" is now commonly referred to as a "vapor retarder". Accordingly, the term "vapor retarder" will be used in all subsequent references throughout the text of this waiver.] Thus, for example, the Standards do not separately address homes placed in humid and fringe environments or climates, which are predominantly located in the southeastern part of the United States. In these climates, it may be beneficial to prevent the outside, moisture-laden air from entering through the warm (exterior) side of the home's exterior wall and condensing and collecting on the cold (living space or interior) side of the wall assembly. One means of preventing moisture from entering the exterior wall cavity from the outside, would be to install a vapor retarder on the warm or exterior side of the wall instead of on the interior or living space side of the exterior wall.

The interior surface of the exterior wall should also then be constructed of a permeable material. This would permit any moisture-laden air that may have entered the wall cavity through a discontinuity in the exterior vapor retarder to be dissipated through the interior permeable material. In such cases, use of vapor retarder paints, vinyl-covered gypsum wallboard, or other impermeable materials or finishes on the interior side of exterior walls could be detrimental, because they would trap moisture within the wall.

II. This Waiver

To address these concerns, HUD is issuing a waiver that applies to the first of the alternatives available under § 3280.504(b), the current condensation control and vapor barrier installation requirements for exterior walls in humid and fringe climates. Specifically, this waiver allows manufacturers of homes for humid and fringe climates to install the vapor retarder on the exterior side, rather than the interior or living space side, of the exterior wall, provided: (1) The exterior side of the exterior wall is constructed with a vapor retarder or exterior covering and sheathing that has a permeance not greater than 1.0 perm; and (2) the interior finish and interior wall panels are designed with a 5 perm or higher rating. The waiver also requires manufacturers to add a statement and a map to the data plate indicating that the home is only suitable for installation in humid and fringe climates (the map designates the acceptable locations for which the waiver is applicable).

III. The National Fire Protection Association (NFPA) Recommendations

Previously, HUD designated NFPA as the organization to undertake a voluntary consensus process to assist the Department in developing recommendations for new manufactured housing standards. Participants in the NFPA process met in December 1999 to discuss comments received on recommended standards changes. One such recommendation involved changes to HUD's regulation in § 3280.504(b)(1) for homes sited in "humid climates" or "fringe climates" as set forth in figure 16, in Chapter 21 of the 1989 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Handbook of Fundamentals. (The Humid and Fringe Climate Map being utilized in this waiver is based on ASHRAE's figure 16.) HUD received the preliminary results of the consensus process deliberations, and the NFPA recommendations have been considered in preparing this final waiver.

The Department expects that recommendations received from the NFPA, research, field data obtained from the use of this waiver, and other information will be available for considering whether to effectuate changes to the standards of a more permanent nature. Any such change would first be reviewed by the Department and the new consensus committee to be established pursuant to section 604 of the Manufactured Housing Improvement Act of 2000(Pub. L.106–569, 114 Stat. 2944, approved December 27, 2000). A proposed rule would then be published for public comment.

IV. Analysis of Public Comments and Other Information Received

The public comments received in response to the proposed waiver ranged from support for the proposal, to suggestions for revising the proposal, to out-right rejection of its provisions. In

general, those who did not favor the proposal indicated that the waiver did not go far enough since it did not address the larger issues of air leakage and transport of moisture-laden or humid air into exterior wall cavities. Two commenters, referencing or quoting the 1993 ASHRAE Handbook of Fundamentals, suggested that while the amount of water deposited in wall or roof spaces by air currents or pressure diffusion cannot be calculated with certainty, under some conditions that amount of water can result in several times the amount of moisture that would be caused by other means, such as vapor diffusion.

While the Department agrees with the concerns raised in the comments, it also believes the waiver provides a partial solution for reducing the extent and number of moisture problems being experienced in Southern climates. Manufacturers who chose to take advantage of the waiver are reminded that it does not consider the larger transport of moisture by air leakage, and that their designs and construction in hot-humid climates also need to address those concerns. Among the strategies manufacturers should consider are: use of exterior air barriers; prevention of air leakage from supply duct systems and other penetrations causing negative pressurization of the home; avoiding use of oversized cooling equipment; and use of balanced mechanical ventilation systems. Complying with the provisions of the waiver does not relieve manufacturers of their responsibilities to use construction methods that result in "durable, livable, and safe housing" as required by 24 CFR 3280.303(b) of the Standards.

Several commenters agreed that an effectively located, good quality vapor retarder could eliminate condensation caused by vapor diffusion (differences in vapor pressure). However, the waiver also requires the interior wall surface to be permeable so that any moisture that does become deposited within the space is not trapped by having an impermeable surface, such as vinyl-covered gypsum panels, on the living space side of the wall.

The NFPA and another commenter recommended that a combined 5-perm rating be used instead of the 3 perm rating suggested in the proposed waiver. HUD agreed with this recommendation since there was no technical basis to support the lower perm rating in recognized engineering manuals, and the final waiver has been revised to require interior finish and wall panel materials to have a combined vapor permeance greater than 5.0 perms. Also, the Manufactured Housing Institute (MHI) collaborated with the Manufactured Home Research Alliance (MHRA) to test commonly used generic interior finish and wall panel designs to determine if they complied with the combined interior perm rating criteria in the proposed waiver. The results of the testing indicate that compliance with the higher perm rating would easily be achieved. Further, based on the Department's review of the MHI test results (submitted to amend MHI's original comments), the Department will not require testing of gypsum panels (textured or non-textured) that are finished or laminated with acrylic or latex paint or non-vinyl decorative wall paper to demonstrate the panels comply with the 5-perm minimum rating; these combinations of interior finish will be deemed to provide an acceptable level of performance.

One State Agency expressed concern about enforcing different provisions for condensation control for the limited geographic area of the State subject to the Waiver. Two commenters were concerned about potential hardships in relocating homes built under the waiver to cold climate areas for which the homes were not suited. However, those concerns are no different than for other geographic-based requirements in the Standards, such as those for thermal, wind, or roof-load protection. Therefore, the Department has not made any changes based on these comments.

Some commenters also suggested there is authority under the current Standards to permit the vapor retarder to be located on the exterior side of the wall. These commenters assert the 1989 ASHRAE Handbook of Fundamentals recognizes this practice and is incorporated by reference into the Standards. The Department does not agree that all provisions of the 1989 ASHRAE have been incorporated by reference, but to the extent they have been incorporated, the requirements of the Standards govern whenever the provisions of the 1989 ASHRAE Handbook are inconsistent with the requirements of the Standards. In addition, Interpretative Bulletin F–1–76 is not appropriate for these circumstances as it was intended to clarify requirements for cold climates, where vapor diffusion would occur from the interior to the exterior of the home and not vice-versa. As such, IB F–1–76 is applicable to the requirements in § 3280.504(b)(2), rather than § 3280.504(b)(1), the provision to which this waiver is applicable.

The Department did not accept a further recommendation of MHI and another commenter to exempt certain construction (kitchen back splash materials, bathroom tub and shower compartments, cabinetry and built-in furniture, and hardwood plywood paneling under chair rail areas) from the combined interior perm requirement, because the Department does not have technical data to support their proposal.

The Department also did not accept the commenters' recommendation to combine and simplify the "humid" and "fringe" designations on the map into one area, as both the ASHRAE Handbook of Fundamentals and the NFPA 501 Standard on Manufactured Housing refer to them as two distinct areas in their maps.

In view of all of the above, HUD is issuing this final waiver, but reminds manufacturers that additional measures are likely needed in the design and construction of their homes to sufficiently abate the moisture problems in hot, humid climates and, therefore, comply with other requirements in the Standards.

V. Alternative Methods

This waiver is not intended to limit alternate approaches by manufactured home producers in assuring that homes built and sited in humid and fringe climates are durable and free of moisture-related problems. Other methods of moisture control that do not meet the Standards or the conditions of this waiver may be submitted for review and consideration in accordance with 24 CFR 3282.14 (entitled "Alternate Construction of Manufactured Homes").

VI. Final Waiver

In accordance with 24 CFR 3280.8 and 42 U.S.C. 3535(q), the Secretary hereby waives, subject to certain conditions, the specific requirements of 24 CFR 3280.504(b)(1) for homes to be sited in humid or fringe climate areas as identified in section V.F of this waiver. Manufacturers who elect to utilize the alternative permitted under this waiver, rather than to follow the existing requirements in 24 CFR 3280.504(b)(1), must produce homes in accordance with the following requirements (all other requirements of the Standards also continue to apply):

A. Exterior walls must be constructed with one of the following installed on the exterior side of the wall assembly: (1) A vapor retarder of not greater than 1.0 perm when measured and tested in accordance with ASTM E–96–93, Standard Test Methods for Water Vapor Transmission of Materials (dry cup method); or (2) an external covering and sheathing with a combined permeance of not greater than 1.0 perm.

B. The interior finish and interior wall panel materials must have a combined

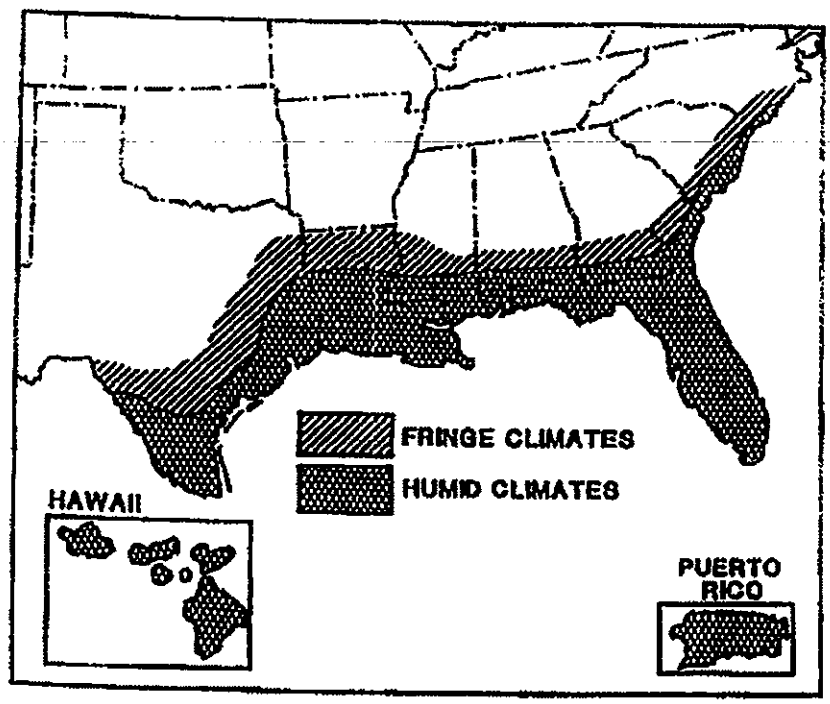
vapor permeance greater than 5.0 perm (dry cup method). Gypsum wall panels (textured or non-textured) that are finished or laminated with acrylic or latex paint or non-vinyl decorative wallpaper need not be tested to establish their compliance with the 5.0 perm combined vapor permeance requirement. Other interior finish and wall panel materials, such as vapor retarder paint, vinyl-covered gypsum wall panels, and other impermeable interior surfaces and finishes, must be demonstrated to have a combined rating greater than 5.0 perm (dry cup method) or they are prohibited.

C. Exterior wall cavities shall not be ventilated to the outdoors.

D. An additional statement shall be provided on the data plate required by 24 CFR 3280.5, to read as follows: "As designed and constructed, this home is suitable for installation only in humid and fringe climates as shown on the Humid and Fringe Climate Map provided with this data plate." The statement is to be typed in bold face using letters at least ⅛ inch in size.

E. A reproduction of the following Humid and Fringe Climate Map is to be provided on the data plate. The map shall not be less than 3½ in. by 2¼ in. in size.

Humid and Fringe Climate Map



F. The following areas of local governments (counties or similar areas, unless otherwise specified), listed by State, are deemed to be within the humid and fringe climate areas shown on the Humid and Fringe Climate Map, and this waiver may be applied to homes built to be sited within these jurisdictions:

Alabama

Baldwin, Barbour, Bullock, Butler, Choctaw, Clarke, Cofee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Lowndes, Marengo, Mobile, Monroe, Montgomery, Pike, Washington, Wilcox

Florida

All counties and locations within the State of Florida.

Georgia

Appling, Atkinson, Bacon, Baker, Ben Hill, Berrien, Brantley, Brooks, Bryan, Calhoun, Camden, Charlton, Chatham, Clay, Clinch, Coffee, Colquitt, Cook, Crisp, Decatur, Dougherty, Early, Echols, Effingham, Evans, Glynn, Wayne, Grady, Irwin, Jeff Davis, Lanier, Lee, Liberty, Long, Lowndes, McIntosh, Miller, Mitchell, Pierce, Quitman, Randolph, Seminole, Tattnall, Terrell, Thomas, Tift, Turner, Ware, Worth

Louisiana

All counties and locations within the State of Louisiana.

Mississippi

Adams, Amite, Clairborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Issaquena, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Pearl River, Perry, Pike, Rankin, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson

North Carolina

Brunswick, Carteret, Columbus, New Hanover, Onslow, Pender

South Carolina

Jasper, Beaufort, Colleton, Dorchester, Charleston, Berkeley, Georgetown, Horry

Texas

Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bexar, Brazoria, Brazos, Brooks, Burleson, Caldwell, Calhoun, Cameron, Camp, Cass, Chambers, Cherokee, Colorado, Comal, De Witt, Dimmit, Duval, Falls, Fayette, Fort Bend, Franklin, Freestone, Frio, Galveston, Goliad, Gonzales, Gregg, Grimes, Guadalupe, Hardin, Harris, Harrison, Hays, Henderson, Hidalgo, Hopkins, Houston, Jackson, Jasper, Jefferson, Jim Hogg, Jim Wells, Karnes, Kaufman, Kennedy, Kinney, Kleberg, La Salle, Lavaca, Lee, Leon, Liberty, Limestone, Live Oak, Madison, Marion, Matagorda, Maverick, McMullen, Medina, Milam, Montgomery, Morris, Nacogdoches, Navarro, Newton, Nueces, Orange, Panola, Polk, Rains, Refugio, Robertson, Rusk, Sabine, San Augistine, San Jacinto, San Patricio, Shelby, Smith, Starr, Titus, Travis, Trinity, Tyler, Upshur, Uvalde, Val Verde, Van Zandt, Victoria, Walker, Waller, Washington, Webb, Wharton, Willacy, Williamson, Wilson, Wood, Zapata, Zavala

Dated: April 16, 2002.

John C. Weicher,

Assistant Secretary for Housing-Federal Housing Commissioner.

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